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AUTHOR	Kliman, Marlene; Mokros, Jan; Parkes, Alana
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ABSTRACT

A set of parent-child math activities designed to help busy, working parents do math with their children as part of everyday situations such as cleaning up and making dinner included basic steps, variations, and information on working with children were developed for families with elementary grades children aged approximately 5 to 11 and distributed at a variety of workplaces to groups of parents who had differing occupations, education levels, ethnicity, and family structures. The activities had titles such as How Much is on the Floor?, How Much Longer?, What's Fair?, How Much Do We Save?, Wish List, and Number of the Day. Seven parents were interviewed 2-4 weeks after they had completed the activities with their children and the ways in which they used and adapted the activities did not appear to relate to their education, mathematical comfort and expertise, or job. The following results were noted: (1) parents used and repeated the activities that fit best with their family life; (2) parents' use of the written materials seemed related to family interaction styles; (3) parents differed in how they prepared for working with their children; (4) parents valued the concrete information on working with children, even though they didn't always use it; (5) parents occasionally added more real-life math skills to the activities; and (6) parents thought their children learned useful skills. (Contains 7 references.) (MO)

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Putting Math Into Family Life: What's Possible for Working Parents[1]?

Marlene Kliman, Jan Mokros, and Alana Parkes
TERC, USA

Abstract

We report on parents' use of a set of parent-child math activities designed to help busy, working parents do math with their children as part of everyday situations such as cleaning up and making dinner. In our initial study with a small and diverse sample, parents' use of the activities did not appear related to their education, mathematical comfort and expertise, or occupation. Instead, parents drew upon their knowledge of their children, family interactions, and the situations they regularly face at home.

Eleven employees are gathered around a table in the lunch room at their workplace. Their occupations range from receptionist to project leader. Some have a high school education, others have finished college, and one has a doctorate. Some work closely together, others are barely acquainted. Their ages range from mid-20s to early 50s. As they open their lunch bags, they chat about what brings them together: children and math.

After a few minutes, Lina, a member of the company's human resources department, welcomes the group to this workshop on putting math into everyday family life. She gives everyone a booklet of math activities for families, and she explains that they'll start by doing one of them. She describes the activity: First, someone chooses a "Number of the Day," then everyone comes up with ways to make that number. If Number of the Day is 11, one solution is 8 + 2 + 1.

Lina invites the group to come up with other solutions. Before long, everyone is engaged. Some work alone, others talk to a partner. Some challenge themselves to find unusual solutions; others try to solve the problem as they think their children would.

After a few minutes, Lina asks for volunteers to share their ways to make 11. These include 13 - 2, 99 ÷ 9, 22 x 1/2, and 3 + 4 + 5 + 6 - 7. She records their ways on chart paper.

Next, Lina raises the question of *when* working parents can find time to do this activity with their children:

In my house, it can be a challenge to find time to do math with the kids. I pick them up on my way home from work, and when we get home, we're all tired, and I've got to make dinner and do the laundry. Sometimes, we do Number of the Day while we're doing evening chores. Are there some times you can think of when you might be able to do Number of the Day—maybe even tonight?

Everyone jumps in with ideas:

In the car, driving home. That's the only time we get to talk.

When I'm braiding my daughter's hair. It takes an hour, and she always gets bored.

Bed time. I tell him a story. We could do a little math, too.

When we're cleaning the house.

At the laundromat.

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[1] We use parents to refer to those primarily responsible for children.

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In the kitchen, when I'm making dinner. This could keep the kids busy so they don't get in my way.

At bath time. When she's in the tub, and I'm just sitting there to keep her company.

At this point, the group has been together for half an hour, and some employees need to return to work soon. Lina uses the remaining time to give an overview of the other math activities in the booklet. She concludes by encouraging everyone to set a lunch date with someone else at the workshop, to talk about what happened when they used the math activities with their children.

Bringing Math to Working Parents

In the U.S. today, there are widespread calls for parents to become more involved in supporting their children's math learning at home (e.g., NCTM, 2000). For some parents, involvement is a challenge. While many parents have ideas on how to help their children with literacy learning, they're not sure what to do when it comes to math (Hartog, Diamantis, & Brosnan, 1998). The often conflicting realities and demands of parents' lives pose another difficulty. Many working parents have little time for learning how to support their children's math learning, and little spare "family time" in which to do math with their children. U.S. parents face increasingly demanding work schedules, requiring many hours away from their children and homes (Hewlett & West, 1998). Mothers are spending an average of 85 hours per week on the combination of paid work and household work (Hochschild, 1989). A full 20% of parents work two jobs, and the average employee works 163 more hours per year now than twenty years ago (Schor, 1992).

If working parents are to do more math with their children, they need approaches that mesh with their time and schedules. We are investigating one possible approach: reaching parents at their workplaces, where they are already spending a great deal of time, and providing them with materials that show them how to put math into things they're already doing with their children, such as household chores, local transportation, and shopping.

In 1999, we began this work with a three-year grant from the U.S. National Science Foundation. In the first year, we developed a set of math activities for families with elementary grades children (aged approximately 5 to 11). We also developed a short workplace-based orientation to those activities, designed to be conducted by a working parent with no special expertise in math. Beginning in 2001, the materials will be disseminated by Ceridian Performance Partners, a company that supports businesses across the U.S. by providing a broad range of employee benefits, including educational materials. The individual businesses pay for these benefits, so they are free to employees.

Throughout the project, we will be researching how working parents use the math activities with their children. In this paper, we report on the first phase of this research and present preliminary findings based on a small, diverse sample of parents.

Subjects and Method

In the first year, our research was conducted as part of activity development. On each of several rounds of testing and revision, we distributed activity drafts to small groups of parents at their workplaces. We asked them to use as many of the activities as they wanted, as often as they liked. Two to four weeks later, we gathered their feedback through questionnaires and, in one workplace, through 30- to 45-minute individual interviews.

The seven parents interviewed include a broad range of occupations (from clerical assistant to senior research leader), educational levels (from high school to doctorate), ethnicity, and family structures (including families with one, two, and three children, a single parent, a single custodial grandparent, and two-parent families). Five of the parents are female and two are male. The children attend suburban and inner-city public school, parochial school, and private school. Most use math curricula that emphasized rote learning of facts and algorithms; a couple use programs that include invented algorithms and explaining thinking. (Although the parents who completed questionnaires reported experiences similar to those interviewed, the interview data is much richer, so we base our discussion on that data.)

The math activities (listed in Figure 1) were designed to give parents extensive support in doing math as part of regular family life. Each activity consists of a 2-page sheet, and includes basic steps, variations, and information on working with children, such as ideas for helping them if they get frustrated with the math and adapting activities for use with more than one child. Activity sheets also include information on children's mathematical thinking, such as ideas for encouraging children to talk about how they solved problems, to check their work by solving problems in more than one way, and to use mental math.

Figure 1: Math Activities

How Much Is on the Floor? Parents use math to make chores more interesting: children estimate how many things are scattered on the floor and then count the things as they put them away.

What's Fair? Parents involve children in the math of dividing up food fairly, so everyone gets the same amount.

Taking Turns Parents put math into turn-taking by giving children turns that are 5, 10, 12, or some other number of minutes long. Children figure out when their next turn begins.

When Should We Leave? Parents involve their children in the math of planning when to leave so they arrive places on time.

How Much Longer? Parents involve their children in calculations with time, so that they can figure out how long until an exciting event begins.

How Much Do We Save? As parents make shopping lists and plan food budgets, they get children involved in the math of grocery store coupon savings, and food prices.

Wish List Parents use advertisements and mail-order catalogs as a basis for math: children make a "wish list" of items they could buy for a pretend spending limit.

Which Holds More? Parents involve children in estimating volume. Children look at several household containers to find the one that holds the most water.

Junk Mail Families investigate paper use and paper waste, as they gather data on how much junk mail comes to the house in a week.

Number of the Day Parents engage children in a computation game that they can do just about anywhere.

Results

Although parents came from a very wide range of backgrounds, the ways in which they used and adapted the activities did not appear to relate to their education, mathematical comfort and expertise, or job. Instead, parents drew upon their knowledge of their children, family interactions, and the situations they regularly face at home.

Parents used (and repeated) the activities that fit best with their family life. For instance, their use of "How Much Is on the Floor?" related to how they approached cleaning. In some families, children didn't like cleaning their bedrooms, but the estimating and counting in the activity made it tolerable, so parents used it repeatedly. Some families were very neat and left nothing on the floor; parents adapted the activity so children were estimating and counting things as they took them out of the clothes dryer or dishwasher. In one family, the parent and child often argued about cleaning. Adding on another task—estimating and counting—only deepened the conflict, and the parent dropped the activity.

Parents' use of the written materials seemed related to family interaction styles. Some parents wove the activities into family life, and never told their children they were doing a math activity. These parents felt that their children would not be receptive to something they knew was math. Other parents took a more direct

approach. They not only told children they were doing math activities, they read their children the activity sheets.

Parents also differed in how they prepared for working with their children. Some carefully read the activities in advance and planned out just how they would introduce them; others only skimmed the activities beforehand. Some parents explained that their use of the written materials was characteristic of their general approach to new things.

Parents valued the concrete information on working with children, even though they didn't always use it. Parents agreed that the clearly defined and detailed activity steps were essential. Most mentioned that they appreciated the ways to work with children (such as ways to help children feel successful when working on a difficult problem), although they often relied on their own strategies for this. Some parents commented that this information set up realistic expectations, giving a sense that the activities can be done in real families, where everyday goals are a high priority.

Parents occasionally added more "real-life" math skills to the activities. Several parents used the time-related activities to teach their children to use analog clocks. Digital clocks are suggested in these activities, but these parents believed that their children should be fluent with analog clocks and saw these activities as an opportunity for practice. None of the activities require calculators, but a few parents introduced them with the money-related activities because they themselves use calculators when working with money.

Parents thought their children learned useful skills. When asked what value they saw in the activities, most parents brought up addition, estimation, counting, and other number and computation skills. Many also mentioned applications of math, such as calculating the price of catalog orders, planning when to leave to get somewhere on time, developing a better sense of time, and finding out how much things cost. They also discussed non-mathematical benefits, such as helping children to keep their bedrooms neater or to get ready on time. Most did not mention children's growth in conceptual understanding or ability to explain their thinking. In fact, they typically reported that they did not take the time to follow the suggestions for supporting children's thinking, such as asking children to explain how they arrived at solutions.

Discussion

Our workplace project is one of a spectrum of approaches to parent-child math learning in the U.S. These range from intensive classes for parents (e.g., Morse & Wagner, 1998) or parents and children (such as Family Math, see Stenmark, Thompson, & Cossey, 1986) to public awareness campaigns, such as Figure This! (www.figurethis.org). Many of these approaches seek to engage parents at the outset in learning about children's mathematical thinking or re-learning math themselves in order to help their children.

By contrast, we start by giving parents step-by-step math activities grounded in the realities of everyday family life. We also provide parents with information on supporting children's mathematical thinking, to use if and when they are ready. So far, our approach seems promising: The seven parents were readily able to integrate the activities into the things they were already doing at home with their children. In using and adapting the activities, they drew upon their deep knowledge of their children, family interactions, and familiar situations, and they relied upon their strategies for handling a variety of family situations. Parents tended to use (and repeat) the math activities that helped them accomplish an everyday goal, such as cleaning up.

Parents felt that the activities helped children learn and practice with valuable math skills; they reported focusing more on children's answers than on the thinking behind those answers. In the coming two years, as we work with a larger sample of parents, we will investigate the extent to which this changes over time: Once parents are experienced integrating math into family life, do they focus more on discussing how children arrived at their answers? Do parents see such discussions as both valuable and feasible? Do the priorities inherent in the everyday situations on which the activities are based—cleaning up, getting the family ready to leave on time, and helping children to take turns—preclude time to discuss the math? To what extent does support from peers, such as co-workers using the same math activities with their children, contribute to the frequency and

nature of parent-child math interactions? Do background factors such as parents' education and occupation, and the math curriculum children use at school, make a difference?

All of these questions bear on identifying just what engages and sustains parent involvement in children's math learning. To date, there has been very little U.S. research in this fundamental area, despite the proliferation of parent involvement projects in math. As these projects evolve, it will be important to investigate and share findings about impact over time, in order to extend our understanding of the limits and possibilities of different approaches for different populations–including parents who are able to attend classes or events on mathematics or children's mathematical thinking, as well as those who prefer to start out by putting math into the things that they already do with their children.

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